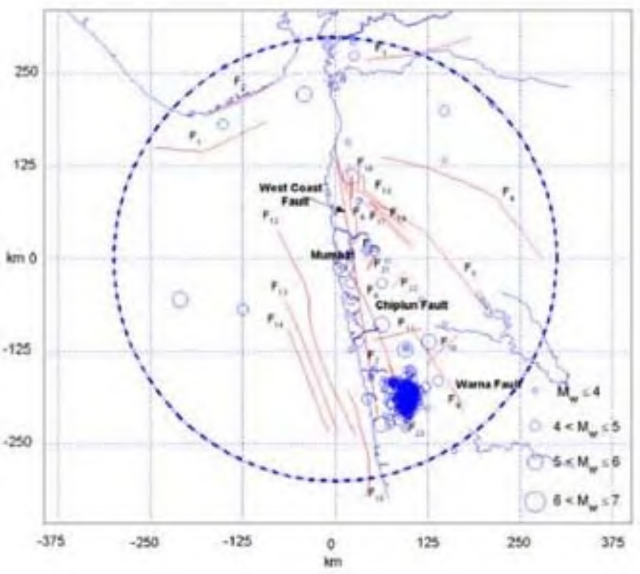
In this issue

Seismic hazard estimation

Peninsular India, once considered to be free from strong seismic disturbances, is now known to be prone to earthquake-related disasters. Koyna (1967), Khillari (1993), Jabalpur (1999) and Bhuj (2001) earthquakes are fresh in our memory and any complacency on this front would be a costly mistake. Since occurrence of such shocks is not predictable, the country has to gear up to protect its human habitat and build environment through sound principles of engineering and progressive technology. There is an official Indian Standard Code IS-1893 on how buildings should be designed against earthquakes. But this document which had once seven and five seismic zones, for computing the design basis forces, currently divides the vast country into four ad hoc regions with no valid scientific basis. Raghu Kanth and Iyengar argue (**page 1486**) that for big cities in India the existing seismic hazard should be quantified on probabilistic basis, factoring in regional seismicity and geology. This way, engineers would be in a position to select the design basis parameters most appropriate to the location, local soil condition and socio-economic importance of the structure. They present a case study for Mumbai, incorporating all known geological and seismological information to arrive at design specifications that engineers and administrators can directly use in Mumbai. These are useful not only for new constructions but also for chalking out strategies for protecting existing ones.



Autoencoder network model

A new method to analyse HIV based on computational intelligence and evolutionary computing is proposed (**page 1467**). This method uses a combination of autoencoder networks and genetic algorithms. The proposed method is tested on a set of demographic properties of individuals obtained from the South African antenatal survey. A method using conventional feedforward neural networks is also implemented. When compared to conventional feedforward neural networks, the autoencoder network classifier model proposed yields an accuracy of 92%, compared to an accuracy of 84% obtained from the conventional feedforward neural network models. The area under the ROC curve is further used to analyse the classifier models. The proposed autoencoder network model yields an area under the ROC curve of 0.86 compared to an area under the curve of 0.8 for the conventional feedforward neural network model. The autoencoder network model for HIV classification, thus outperforms the conventional feedforward neural network models and is a much better classifier.

Coiled nanotube

The discovery of fullerene was perhaps a serendipity. But it led to a number of other fundamental discoveries, including carbon nanotubes in 1991. That in turn heralded the era of nanoscience and nanotechnology. Lots of experimental efforts have gone into producing nanotubes of various kinds, including tubes with junctions and helical nanotubes because of the profound technological implications. Interestingly, the first discovery of carbon nanotubes included coiled nanotubes, which can have useful mechanical properties. While it is easy to visualize the formation of a nanotube by rolling a graphite layer, the mechanism for the formation of coiled nanotubes remains uncertain. By using a computer modelling, Ramachandran and Sathyamurthy (**page 1503**) show that a coiled nanotube can be formed by rotational distortion of carbon atoms between adjacent layers running perpendicular to the tube axis, without altering the hexagonal motifs in the graphite sheet. It involves 4320 carbon atoms per pitch – too large to be handled by good quality electronic structure calculations, but amenable to molecular mechanics studies.